



PROJECT REVIEW

Good Vibrations

Project: Utah State Capitol, Salt Lake City, UT

Architect of the Capitol: David Harris Hart, AIA

Architect: Capitol Restoration Group, Salt Lake City, UT, an association of VCBO Architecture and MJSA of Salt Lake City and Schooley Caldwell Associates of Columbus, OH

By Martha McDonald

Take a 320,000-sq.ft., 168 million-lb. historic reinforced-concrete capitol with a 226-ft. tall copper-covered dome and shake it around a bit and what happens? Not that much, according to Reaveley Engineers of Salt Lake City, because a comprehensive, one-of-a-kind seismic upgrade has just been installed as part of a multi-year multi-million dollar historic preservation effort.

The building in question is the Utah State Capitol in Salt Lake City. It was designed by Richard K. A. Kletting and completed in 1916, at a time when Utah was developing a sense of pride in its statehood. The grand Beaux Arts building resembles the U.S. Capitol more closely than many other capitol buildings constructed during this era.

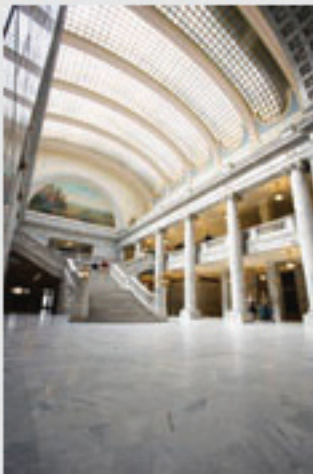
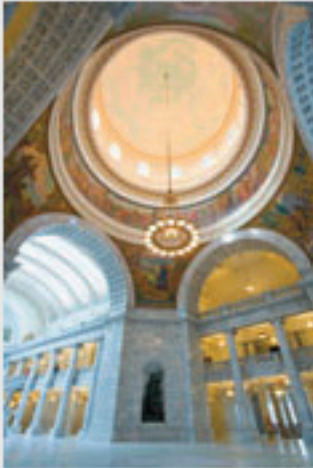
When restoration began in 1998, researchers found that time had taken its toll on the building. The first phase of the project was the preparation of the historic structures report by Cooper Roberts, Simonsen Architects (CRSA) of Salt Lake City, working with the Capitol Preservation Board. It was completed in 2001. During the early days of the project, two drawings were found that when combined, created the new master plan for the capitol campus. The first was by John C. Olmsted, who was hired in the 1880s to identify the site. He created a park-like setting with an elliptical walkway. The second was a site plan by Kletting. It provided for growth with three additional buildings surrounding a quadrangle.

Phase two, from 2001-2004, saw the completion of a new master plan and construction of two new buildings as envisioned by Kletting in the capitol complex, the Senate and House Buildings on the 40-acre site. A joint venture including FFKR Architects; Gillies, Stransky, Brems & Smith (GSBS); along with CRSA, all of Salt Lake City, led this phase of the work. "These two 80,000-sq.ft. Neoclassical buildings were designed and built to be compatible and subservient to the original capitol," says architect of the capitol and executive director of the Capitol Preservation Board, David H. Hart, AIA. With the new structures in place, the board turned its attention to the renovation of the original building. At this point, the architects were selected and the Capitol Restoration Group was created, including VCBO Architecture, MJSA and Schooley Caldwell Associates. "We were engaged in 2002 to begin the design work for the restoration of the capitol," says Robert N. Pett, AIA, president of MJSA and lead design architect for the project. "It was a multi-phased, complex project, encompassing a full seismic upgrade, complete replacement of all systems and a restoration of the interior, exterior and the site." The construction manager was a joint venture between Jacobsen Construction, Salt Lake City, and Hunt Construction, Phoenix, AZ (JHJV).

Another unusual aspect of this project was the collaborative effort. The architects proposed putting an office on the site so that everybody would work together under one roof, including the construction manager. "That was a huge change for the architects and engineers, but it gave us a tremendous team that was completely unified and that was committed to doing things right from the beginning," says Hart. "It eliminated all of the adversarial issues. We have a total change order of less than four percent and that's unheard of for a \$212 million job. It goes back to the collaborative effort." Before the work began, 17 workshops were conducted on the different aspects of the building and the job. "We wanted to get everyone on the same page," Hart notes. "We worked through the issues and problems together, setting guidelines and imperatives. The architects took the information from these workshops and created the scope documents."

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The seismic work done by Reaveley Engineers + Associates of Salt Lake City; UT, and Forell/Elssesser Engineers, of San Francisco, CA, involved removing the entire foundation of the building to make room for the base isolation system. It incorporates 265 base isolators each weighing 5,000 lbs. that are interconnected to a series of concrete beams. "They act in concert to allow the building to move and to reduce the impact of the earthquake," says Jerod Johnson, S.E., chief engineer and principal with Reaveley. "The building is sitting on base isolators so it can move as much as 24 inches in either direction, lumbering back and forth slowly relative to the ground, so the large movements from the earthquake don't have such a severe impact on the building. It lessens the impact of an earthquake by 80 percent."

What is different about this base isolation system, he explains, is that the Utah State Capitol is the first historic concrete building to use the technology. "There are maybe a dozen historic buildings in California, such as the San Francisco and Pasadena city halls, that have installed base isolation systems, but they are structural steel construction. The Utah Capitol is the first historic building of this magnitude that is comprised of reinforced concrete that has base isolation."

The base isolation technology was chosen because it is the least invasive. "It became the only alternative in terms of the historic spaces of the building. We were given the directive that we were not to change the character of the building," Johnson notes. "This was the only way we could improve the safety of the building and keep the historic character."

The seismic update also involved strengthening the building with concrete walls hidden within the structure. These were located in areas such as abandoned ventilation shafts. The addition of these concrete support walls increased the weight of the building from 132 million pounds to 168 million pounds. "It's a massive building," says Johnson. "It weighs more than twice what a new building of similar size would weigh."

When the foundation was removed, the architects decided to build a large terrace around the building, which like the east and west buildings, had been specified by Kletting from the beginning, but never built. "The loss of the use of the basement displaced mechanical systems as well as the occupants," says Pett. "Much of the space that was displaced was recovered in the new terrace structure. The project included a complete replacement of all of the mechanical, electrical and a/v systems, of all technology," he adds, "as well as a full restoration of the finishes."

The architects and engineers worked together to preserve the historic fabric of the capitol "This building has wonderful internal spaces, a rotunda and two flanking atrium spaces that are three stories high, with skylights and monumental stairs on either side," says Robert Loversidge, Jr., FAIA, president and CEO of Schooley Caldwell Associates. "For us, the challenge was the idea that we could design this building so it could take a journey of 20 inches – that's a long journey for a masonry building – and still preserve its historic character."

In some cases, the concrete walls that the engineers wanted to build to reinforce the building had to be denied. "Sometimes these were in historic areas and we had to say no," says Loversidge. "The walls are necessary so that when the base of the building moves, the top goes with it, but they had to be hidden in out-of-the-way places."

Hart notes that much of the public space on the first floor of the three-story building had been closed off for offices over the years. One of the priorities was removing as many of the non-historic walls as possible to let light back into the public spaces. Skylights and windows were also restored to reintroduce natural light into the building.

Where lighting was involved, the architects wanted to return to the historic appearance. Working directly with the architects and lighting consultant Randy Burkett of St. Louis, MO, Rambusch Design Studio of Jersey City, NJ, restored, repaired and replicated lighting fixtures for the capitol. "We went from being a lighting vendor to being part of the design team," says Rambusch president Edwin Rambusch, commenting on the high level of communication and cooperation on the project.

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His firm disassembled, documented, restored and re-installed 450 historic fixtures in the building. In addition, many fixtures were replicated or were created in a period-appropriate style. "We delivered approximately 1,400 lighting fixtures in 46 different families to the Utah Capitol," he notes. "In some cases we replicated fixtures and in some cases, we created new fixtures that were appropriate to the building. This is one of the largest jobs we have undertaken. Because there was such open communication within the design team, it went very well."

"We realized that the lighting was too complicated to specify," says Hart, "so we brought Rambusch into the process as part of the design-assist team, which allowed them to provide both design assistance and the physical restoration and replication work. They brought historic lighting back to the capitol. It is one of the great successes of the project."

The largest fixture in the building is the chandelier in the central dome, which weighs 6,000 pounds. In addition, the skylights and laylights were restored, bringing light back into the vast public spaces. "We tried to be as true to Kletting's notion of light as we could be," Hart points out. "We reopened auxiliary corridors, restored all skylights, reopened windows in the rotunda. All of that natural light now floods into the building. Then at night, the restored lighting once again lights the building. Here, we tried to be as energy-efficient as possible, using compact fluorescent lighting in 95 percent or more of the building."

Historic windows were replicated by Re-View of N. Kansas City, MO. The firm designed, fabricated and installed 539 historically correct 6x14-ft. mahogany windows to replace aluminum windows that had been installed 40 years ago. Features like modern weather stripping and insulated glass were used to achieve energy efficiency within the original elements of the windows.

EverGreene Painting Studio of Chicago and New York City restored the decorative painting and murals throughout the building. This included the restoration and repair of the dome mural, a sky scene of seagulls flying from the Great Salt Lake. In some cases, new paintings and sculpture were created to coordinate with the existing fabric. For example, Utah painter David Koch was commissioned to paint two new murals for the coves in the house chambers and new monumental bronze sculptures were created for niches in the rotunda by Daub, Firmin Hendrickson, a three-sculptor partnership based in Berkeley, CA. Many other subcontractors were also brought in to work on the building. The extensive plaster restoration was directed by E.B. Berger, Inc. of Salt Lake City, UT, and new marble lions are being carved by Nick Fairplay of Oberlin, OH, for placement at the east and west entrances. The four original 9 ft. long by 5 ft. tall lions had deteriorated over the years.

New reproduction torchieres around the exterior terrace were designed and built by Historical Arts & Casting of West Jordan, UT, and fabric wallcovering for the State Reception Room and the Ceremonial Office of the Governor was designed and created by Scalandre of New York City. After almost a decade of work and planning, and 91 years after the capitol was completed in 1916, the Utah State Capitol campus is now ready to serve the citizens of the state for at least another 100 years, with its magnificent original building serving as a view to the past and a beacon to the future.

"When the Capitol was built, the intent was to show that we were not an isolated state," says Johnson. "It took a lot of sacrifice to build it 90 years ago at an original cost of \$2.7 million. We pride ourselves on respecting what was here before. And, it would have cost \$800 million to replace it, so a \$212 million renovation is wise use of state funds."

"We tried to stay as true to the building as we could," says Hart. "Whenever we had a problem in the restoration process, we always went back to the two masters, Olmsted and Kletting. As long as we went back to the original plans, we were always able to solve the problems of the historic building and make it work for a modern society." TB